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YOUR CAREER

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If you are studying or belong to these professions, the Department of Mines and Technical Surveys may be of interest to you . . . .

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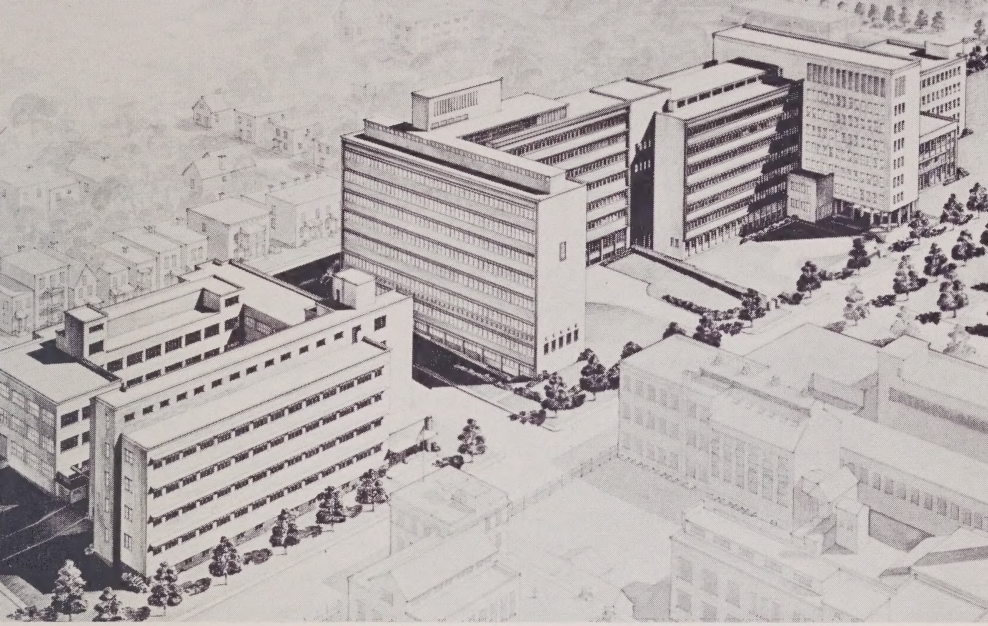


The Department of Mines and Technical Surveys, Ottawa.

A FIELD WITH A FUTURE

Canada's mineral development is a story of unparalleled growth and unlimited promise. A vast mineral reservoir, Canada is world's leader in the production of nickel and asbestos; second in the platinum metals, zinc, gypsum and cobalt; third in gold and silver and fifth in the production of copper, lead and iron ore. The surge of western oil and natural gas, the ever-widening ranges of newly-discovered iron ore, the rapid growth of uranium mining—these are spectacular bright spots in a picture of unending opportunity.

You can be a part of that picture. Here is the opportunity to use your education and experience to full advantage in a position of good income, steady employment and recognition. Here is the chance to work on projects of long-range significance, be a part of the greatest mineral development of all time.

Rolling back the Arctic frontier, mapping Canada's northland, uncovering new areas of geological import,

developing new alloys for the needs of the space age—this is the challenge confronting our modern-day pioneers; and playing an important role in meeting this challenge is the Department of Mines and Technical Surveys.

Work in the Department touches on most branches of science and engineering. Geodesists, hydrographers, geologists, mineralogists, metallurgists, physicists, astronomers and geographers are among the professions represented (see page 1). Depending on your training, your work may involve research in a well-equipped laboratory or field trips to any part of the Canadian outdoors—the settled south or the rugged north.

One of the Department's principal aims is to provide technical help in developing our mineral resources. This is done through research involving metallic ores, nonmetallics and fuels, and through survey work (geodetic, hydrographic, geological, etc.). Its activity embraces other areas of scientific study such as astronomy, geography and geophysics. Actually the Department's five basic branches are in the process of writing Canada's natural history, describing her resources and external features, and pinpointing her position in the universe.

SURVEYS AND MAPPING BRANCH

GEODETIC SURVEY • TOPOGRAPHICAL SURVEY • LEGAL SURVEYS AND AERONAUTICAL CHARTS • CANADIAN HYDROGRAPHIC SERVICE • MAP COMPILATION AND REPRODUCTION •

The work of the Surveys and Mapping Branch helps lay the foundation for our economic progress. Canada's industrial expansion has created an increasing demand for accurate maps, charts, aerial photographs, etc. and for these the country depends largely on the Branch's five divisions.

The work of the *Geodetic Survey* forms the basis for all surveying and mapping in Canada. Its goal is to establish a framework of basic survey control from the U.S. border to the tip of the northernmost Arctic island. Survey stations are established at points, the position and/or elevation of which are determined with painstaking accuracy. In horizontal control (determining longitude and latitude) the work has been greatly expedited by the use of shoran, one of several electronic techniques used by the Branch, so that no point in Canada is now more than 150 miles from a control station. Industrialized areas, of course, require a greater density of control and precise levelling (vertical control) has been concentrated mainly in settled areas and along rail lines and highways.

Carrying the map-making process a step further, the *Topographical Survey* plots all significant natural and artificial features. This is done with the aid of aerial photographs, ground control for which is provided by the Field Survey Section. An essential tool in the development of our natural resources, topographic maps are drawn to differ-

One of the latest surveying devices, the tellurometer, an electronic distance-measuring instrument of high accuracy.

Above—*The preparation of mosaics from aerial photographs for the use of topographical field parties in areas where ground control is being established.*

Centre—*Hydrographers reading a reversing deep-sea thermometer after the completion of an oceanographic station.*

Left—*The C.G.S. Baffin, one of the most modern hydrographic vessels in the world.*

A surveyor takes a sight on the cairn from the line of survey on lower ground.

ent scales, principally of 1:50,000 and 1:250,000 but so far cover only a relatively small portion of the country. Much work remains. A major assault is currently being made on the Arctic Islands where 500,000 square miles are being photographed, a project that will take a dozen æroplanes six years to complete.

An integral part of the Topographical Survey is the National Air Photo Library which has on file over 2,650,000 aerial photos covering practically all of Canada. These are put to a variety of uses in government and industry by geologists, prospectors, foresters, engineers and many others. The Topographical Survey also administers the Canadian Board on Geographical Names.

The Legal Surveys and Aeronautical Charts Division surveys Crown lands, Indian reserves, interprovincial boundaries, etc. It prepares aeronautical charts and distributes flight manuals essential to safe air travel.

Charting Canada's coastal and inland waterways is the work of the *Canadian Hydrographic Service* which also produces sailing directions, tide tables and other aids for mariners. The development of the Arctic, the St. Lawrence Seaway, the clearing of Seymour Narrows and other projects have added to the already heavy demand for nautical data. In this work the Service is making use of seven ships, six large launches and several smaller vessels, an effective task force for hydrographic surveys in any part of Canada.

Drafting, publishing and distributing the maps and charts produced by the Branch is the responsibility of the *Map Compilation and Reproduction Division* which is at present shouldering a gigantic work load from speeded up survey programs. In the face of a two-year backlog of work the Division is making use of all the techniques and tools modern cartography can provide and will shortly move to new, well-equipped quarters. Canadians are great map users. In this age of northland penetration the Division will undoubtedly have more work than ever.

Qualifications for a career in geodesy, topography, hydrography, cartography or land surveying include a university degree in mathematics, physics or civil engineering. Acceptable in certain cases is a Master's or First Mate's Certificate or a Provincial Land Surveyor's Certificate.

GEOLOGICAL SURVEY OF CANADA

PRECAMBRIAN • POST-PRECAMBRIAN • FUELS AND STRATIGRAPHIC GEOLOGY • MINERALOGY • MINERAL DEPOSITS • GEOPHYSICS •

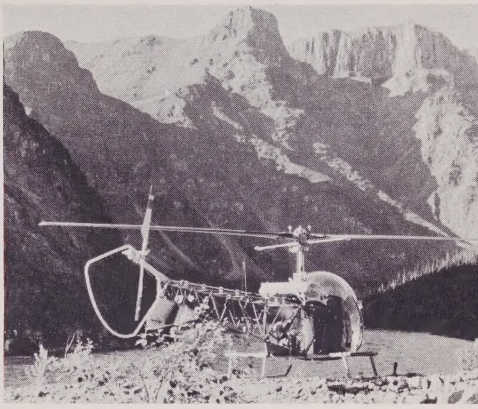
The Geological Survey of Canada conducts a systematic study, in the field and in the laboratory, of the geology of the country. Its work has greatly furthered the development of our mineral resources and solved many a fundamental geological problem.

The Survey's main objectives:

1. To study, map and explain the geology of Canada and thereby determine the nation's potential mineral resources; provide industry with the data required for the discovery and exploration of the nation's mineral deposits.
2. Assist planning and development by providing fundamental data concerning engineering projects, water supply, and other factors affecting land use; and contribute to the science of geology.
3. To carry on other research that will contribute to man's knowledge of how and when the rocks of the earth's crust and the mineral deposits therein were formed.

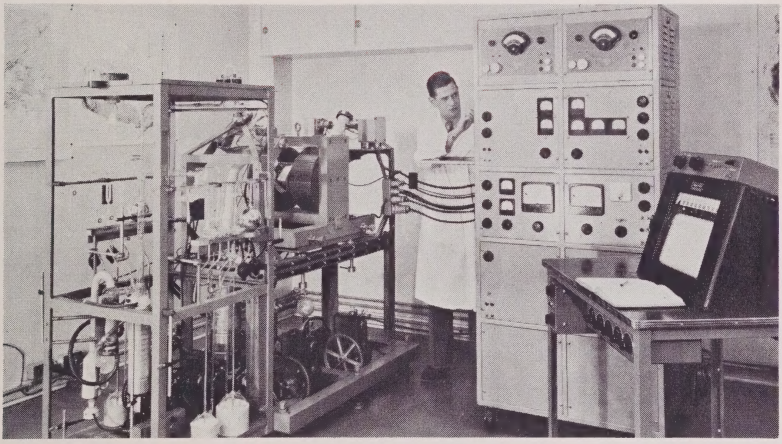
In summer as many as 80 parties may be in the field. As a geologist or an assistant on one of these surveys, you may be sent to any part of the country. *Precambrian* specialists have, of course, the entire Canadian Shield and Arctic Islands as a

A geologist inking in the results of a day's field work on an aerial photo.



Right—*In Operation Mackenzie the Geological Survey of Canada made extensive use of the helicopter. A total of 100,000 square miles of territory was mapped including the First Canyon of the South Nahanni River shown here.*

Below—*A mass spectrometer used to determine the absolute age of rocks and minerals.*



work area while the staff of the *Post-Precambrian Division* concentrates on bedrock surveys of the Appalachian and Cordilleran regions and on surficial geology and ground-water surveys throughout Canada. Stratigraphic palæontology and the geology of coal, oil and natural gas are the responsibilities of the *Fuels and Stratigraphic Geology Division.*

The *Mineralogy Division*, in a group of well-equipped laboratories, aids and conducts research on rocks and minerals by mineralogical, analytical, geochemical and petrographic methods, and by isotopic and nuclear geologic studies. Its work furthers research in ore genesis and provides useful information for prospectors and the entire mineral industry.

A geologist of the Survey's Calgary office examines drill cores.

Critical studies of ore deposits with emphasis on their origin, geologic import, and economic potential are undertaken by the *Mineral Deposits Division.* Its facilities include a laboratory for radiometric assays and radioactive minerals.

The *Geophysics Division* carries out surveys and gathers geophysical data that may be of use to the field geologist and the prospector. Its maps have been of value in the search for iron, oil, and other minerals; its research has brought about the development of new geophysical techniques.

With the great task of mapping and interpreting Canada's geology, the Geological Survey makes full use of the aids of modern technology. Helicopters are speeding reconnaissance mapping; magnetic resonance techniques are being evaluated as possible new geological tools; geochemistry—a relatively young science—is coming into its own. A new building will give the Survey breathing room for a host of important laboratory research projects.

So far geological maps and reports cover slightly more than one-third of Canada, and so great is the remaining area that the Survey has been giving top priority to reconnaissance mapping. The Survey employs geologists of every category, including "hard rock" specialists, stratigraphers, palæontologists, petrographers, as well as mineralogists, geophysicists and geochemists. Most have Doctorate degrees and, in general, the qualifications for a position are high. In both field and laboratory a position with the Geological Survey of Canada offers a rewarding opportunity to contribute to the development of Canada and to the advancement of science.

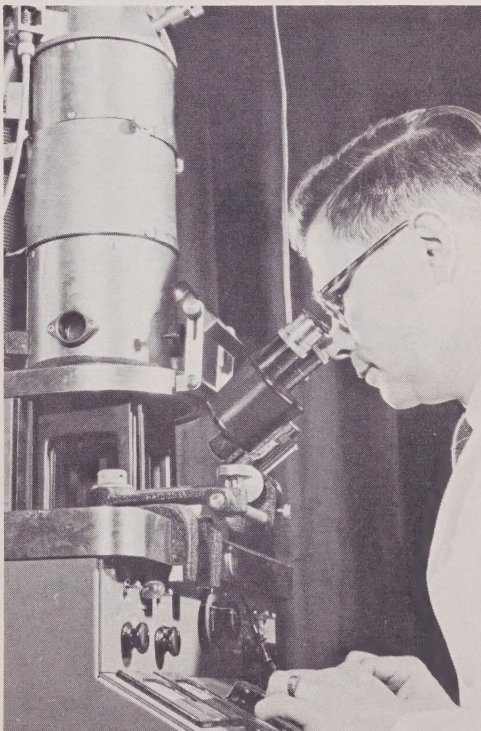
MINES BRANCH

INDUSTRIAL MINERALS • FUELS • MINERAL DRESSING AND PROCESS METALLURGY • RADIOACTIVITY • PHYSICAL METALLURGY •

Investigations undertaken by the Mines Branch cover a vast range of technical projects of importance to the advance of fundamental research, to the processing of ores, industrial minerals and fuels on a commercial scale; and to the theory and practice of physical metallurgy.

The technological help the Mines Branch has given to industry is evident in nearly every mining camp in the country. It is seen in the metal and industrial mineral mines, many of whose mills operate on processes developed in the Branch; in the foundries and metal plants which are making use of techniques suggested by the Branch and of new alloys developed in its laboratories.

The *Mineral Dressing and Process Metallurgy Division* is investigating all types of metallic minerals. The main goal: to devise more efficient, less costly processing methods with particular emphasis on low-grade and complex ores. In fact, Division laboratories are equipped to undertake almost all manner of mineral-dressing and pilot-plant work. Once a deposit has been developed, laboratory studies are conducted to determine the processing problems likely to be encountered and these form the basis of a flow sheet which is recommended to the company. The lead-zinc developments in British Columbia and the low-grade gold properties of western Quebec are classic examples of what this type of research can mean (recent projects have concerned nickel-copper, iron, iron-titanium, manganese,

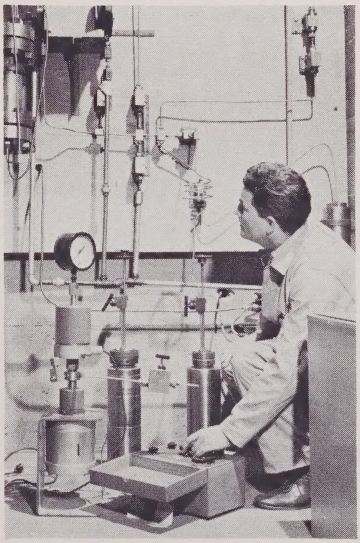


The electron microscope is used to examine the ultrafine structures of metals at magnifications up to 100,000.

niobium ores and others). The work of the Mineral Dressing and Process Metallurgy Division has, in fact, brought success to many otherwise doubtful ventures and benefited almost every producing metal mine in Canada.

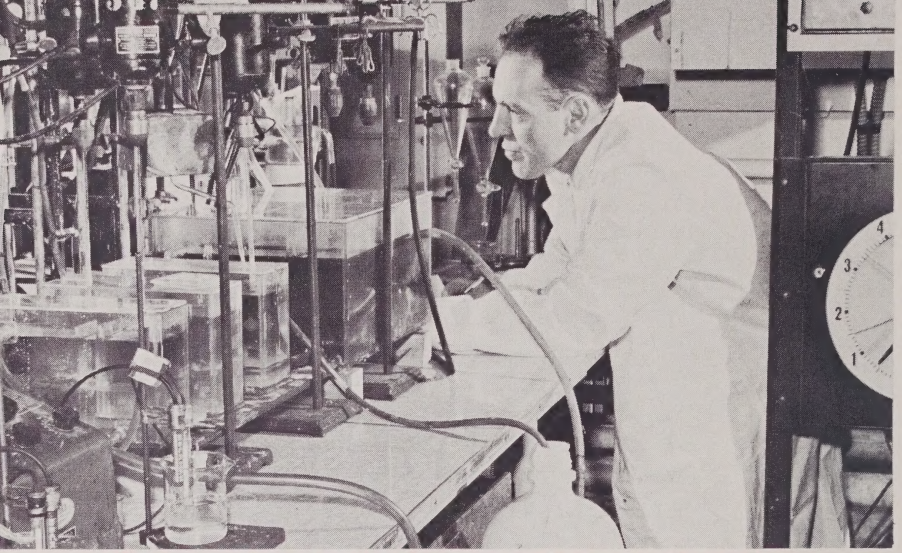
As the title implies the *Radioactivity Division* seeks improved methods of treating radioactive ores. One of its major technical achievements has been the development of the acid-leaching process that has literally boosted Canada's uranium mines into production. Research is underway toward simpler, lower-cost methods of uranium recovery; and on the application of solvent-extraction techniques to recover thorium as a by-product. The Division has pioneered in the chemical analysis of radioactive ores and in the development of radiometric assaying. Current investigations concern the use of the gamma-ray spectrometer for uranium and thorium determinations, and new isotope applications. These and other projects have helped put Canada in the forefront in radioactive mineral research.

The *Industrial Minerals Division* concerns itself mainly with non-metallic deposits including those of asbestos, gypsum, barite, fluorite, kyanite and others; and with sands, clays, building stones, concrete and road aggregates, and industrial water supplies. Its work is benefiting many varied industries: producers of construction materials, manufacturers of glass, brick, tile and refractories, miners of asbestos and potash, to name a few. On occasion Division research has created new industries. Work on brucitic limestone has resulted in the production of magnesia for the manufacture of refractories and other purposes. Research on concentration of kyanite, also



Left—*Matte is tapped from a 250KVA electric arc furnace used by the Mines Branch in a pilot-plant investigation of a complex nickel ore.*

Right—*An adjustment is made to high-pressure equipment used in the study of the effects of pressure and radiation on the chemistry of pure compounds—part of a project aimed at the improvement of low-grade oils.*

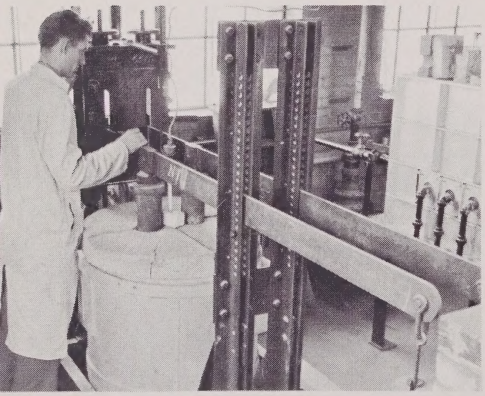


Continuous solvent extraction of uranium and thorium from leach solutions is carried out during the investigation of a radioactive ore.

used in refractories, may make Canada a commercial producer of this mineral. Ceramic electronic components, now under development, will no doubt have a host of industrial and military applications. Since 1946, the Division has been surveying the nation's water supplies, providing vital data affecting industrial waste disposal, corrosion, the use of water in heating plants and other problems.

Much of the research in the *Fuels Division* has been directed towards the coal industry, helping it to maintain a reasonably competitive position in relation to other fuels. The Division is working on new cleaning and beneficiation methods to improve the product and reduce wastage, and on the blending of coals to provide high-quality cokes for blast furnaces and foundries. It is investigating many of the hazards of coal mining including a study of the causes of so-called "bumps" and "outbursts".

In addition, the Fuels Division is using a hydrogenation pilot plant to develop techniques for refining high-sulphur oils



An engineer evaluates the characteristics of mullite refractories made in Branch laboratories from kyanite under load at high temperatures.

and bitumens. Examples of the variety of work being pursued in the chemistry of oil by the Division include research on catalysts, vital to refining technology, on the production and properties of pitches and on the origin of oil.

The *Physical Metallurgy Division* has done much to further the science of metal fabrication. New alloys, new manufacturing techniques, new applications have been sought and found. Recent achievements include a new process for treating drill rods (by means of spiral rolling), increasing their strength and service life; and a practical method of reducing the sulphur content of acid-electric steel. Of special importance is the Division's role in the development of components used in military equipment and materials for nuclear power plants.

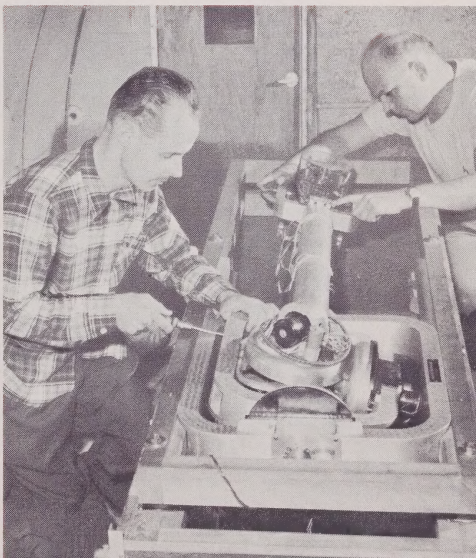
Adding to man's knowledge of metal behaviour, understanding the limiting factors affecting the strength of metals, probing the mysteries of the crystal lattice—are of great importance to human progress. In this age of missiles and satellites, the Physical Metallurgy Division has a key role to play.

In these diverse activities the Mines Branch employs metallurgists; mining, chemical and refractory engineers; physicists and graduate chemists. It is a forward looking organization—a powerful catalyst in the growth of the economy.

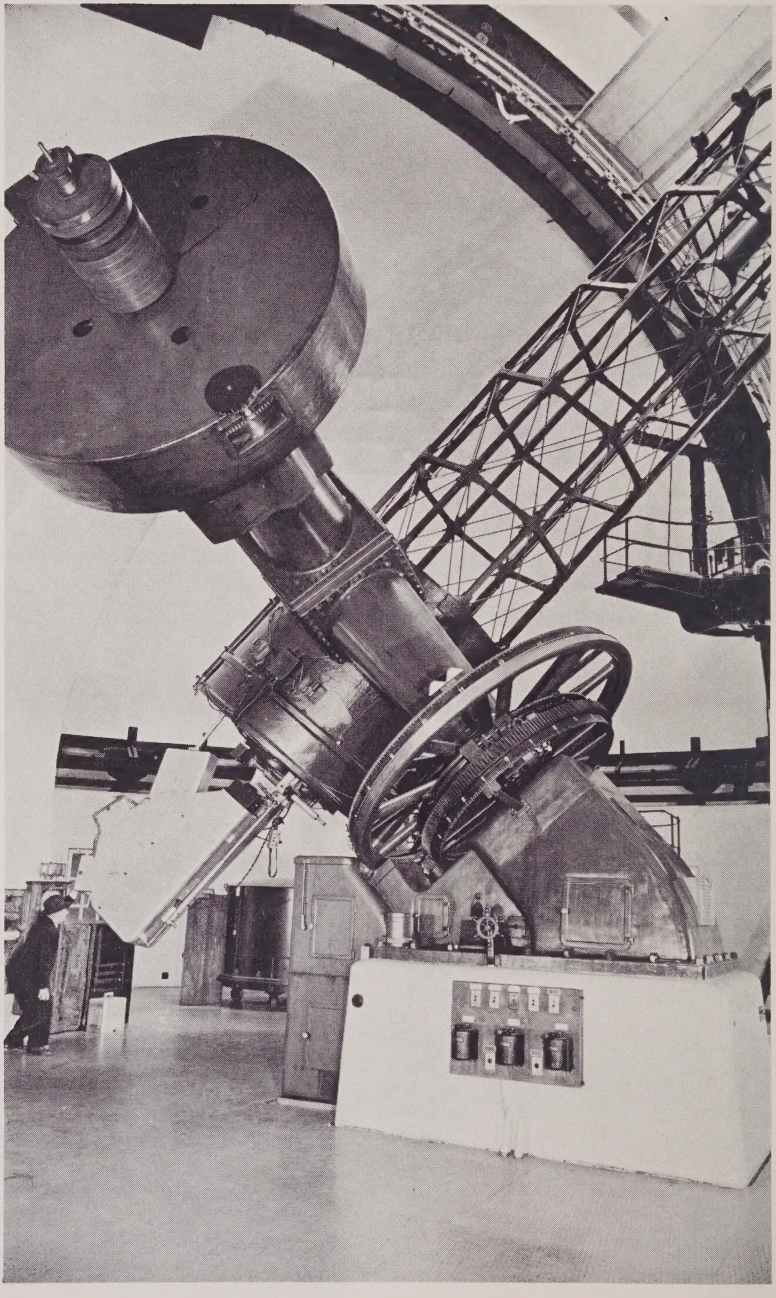
DOMINION OBSERVATORIES

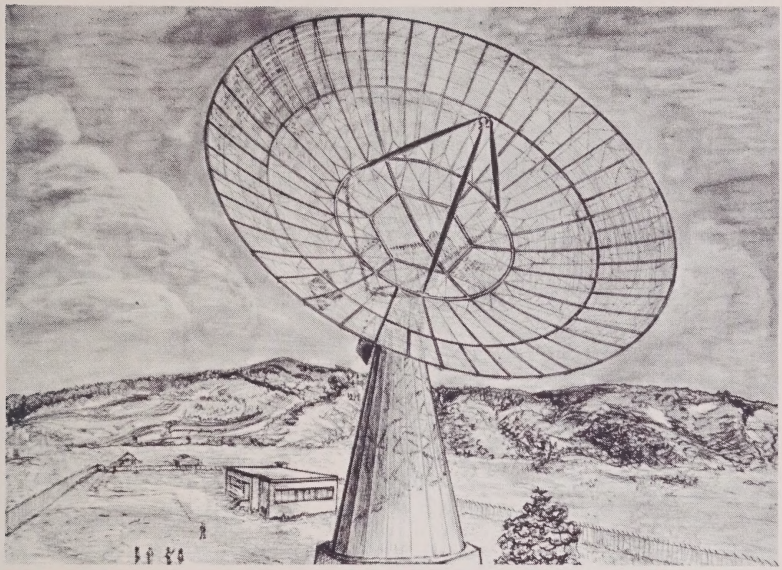
POSITIONAL ASTRONOMY • STELLAR PHYSICS • GEOMAGNETISM • GRAVITY • SEISMOLOGY •

The Dominion Observatories—located at Ottawa and Victoria, B.C.—specialize in such matters as positional astronomy, stellar physics, terrestrial magnetism and gravity. A new radio telescope at Penticton will soon give the Branch a valuable new tool for research in radio astronomy.



The three-component gyrostabilized airborne magnetometer developed by the Dominion Observatory.





Sketch of the new radio telescope under construction at Penticton, B.C. which will give the Dominion Observatories a valuable new tool for research in radio astronomy.

Astronomers in Ottawa are using star positions to determine time to an accuracy of one ten-thousandth of a second. Their time signals are sent by radio to aerial navigators and ships at sea, and by wire to the C.B.C., the Bell Telephone Company and other organizations; and they conduct meteor and sun-spot observations and are carrying forward projects of the International Geophysical Year. Surveying the earth's magnetic field, measuring gravity, studying earthquakes, are among the Dominion Observatories' projects.

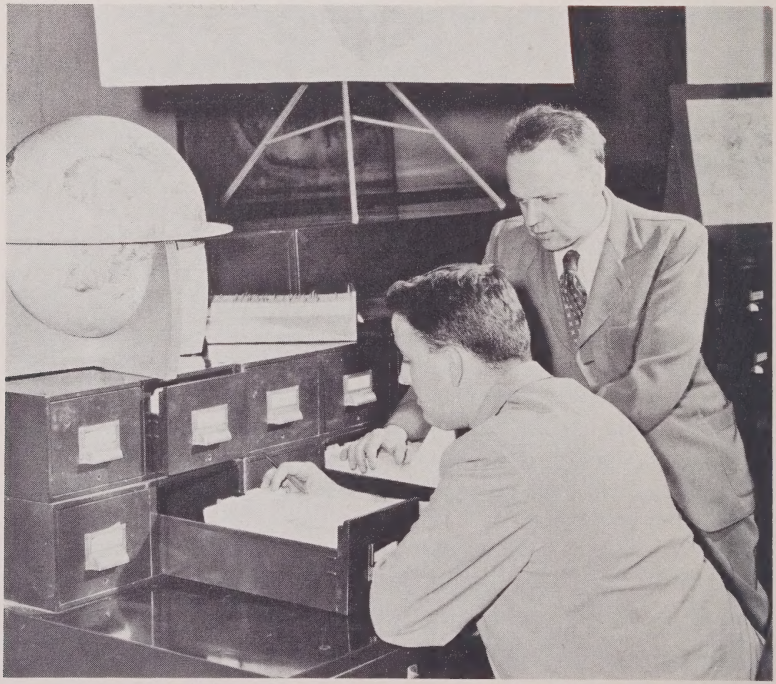
The astrophysical observatory at Victoria has a 73-inch reflecting telescope at work exploring the motions and physical properties of stars. High temperature stars, binary stars and large eclipsing stars have been targets of special interest.

Astronomers, astrophysicists, geophysicists, seismologists, mathematicians and physicists play a part in the research both at Victoria and Ottawa. The Dominion Observatories not only contribute to man's knowledge of the earth, but help solve some of the most perplexing mysteries of the universe.

Left—*The 73-inch reflecting telescope at the Dominion Astrophysical Observatory in Victoria, B.C. is one of the world's largest.*

Left—*The Geographical Branch operates the schooner Tuhlik along the Arctic coast during its studies of Arctic terrain.*

Below—*Checking card indexes in the Geographical Branch's map library—one of the tasks in the preparation of the new Atlas of Canada.*



GEOGRAPHICAL BRANCH

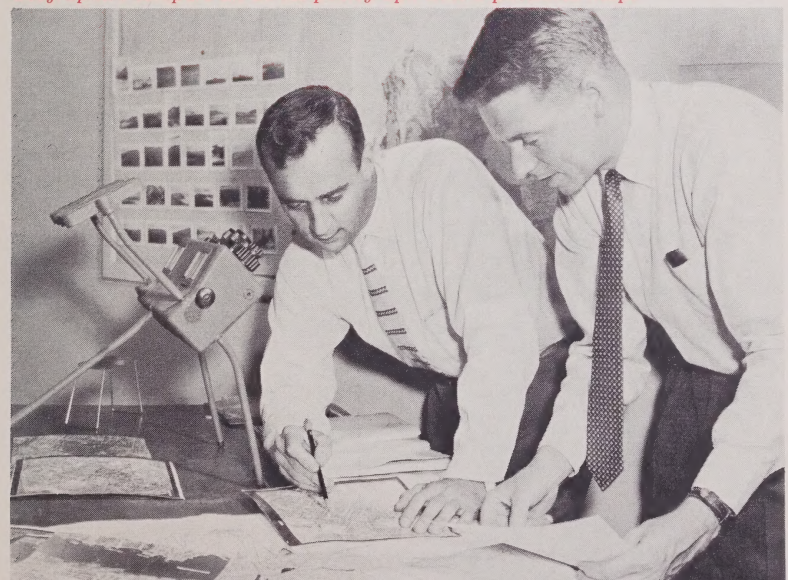
RESEARCH DIVISION • TECHNICAL SERVICES • REFERENCE SERVICES •

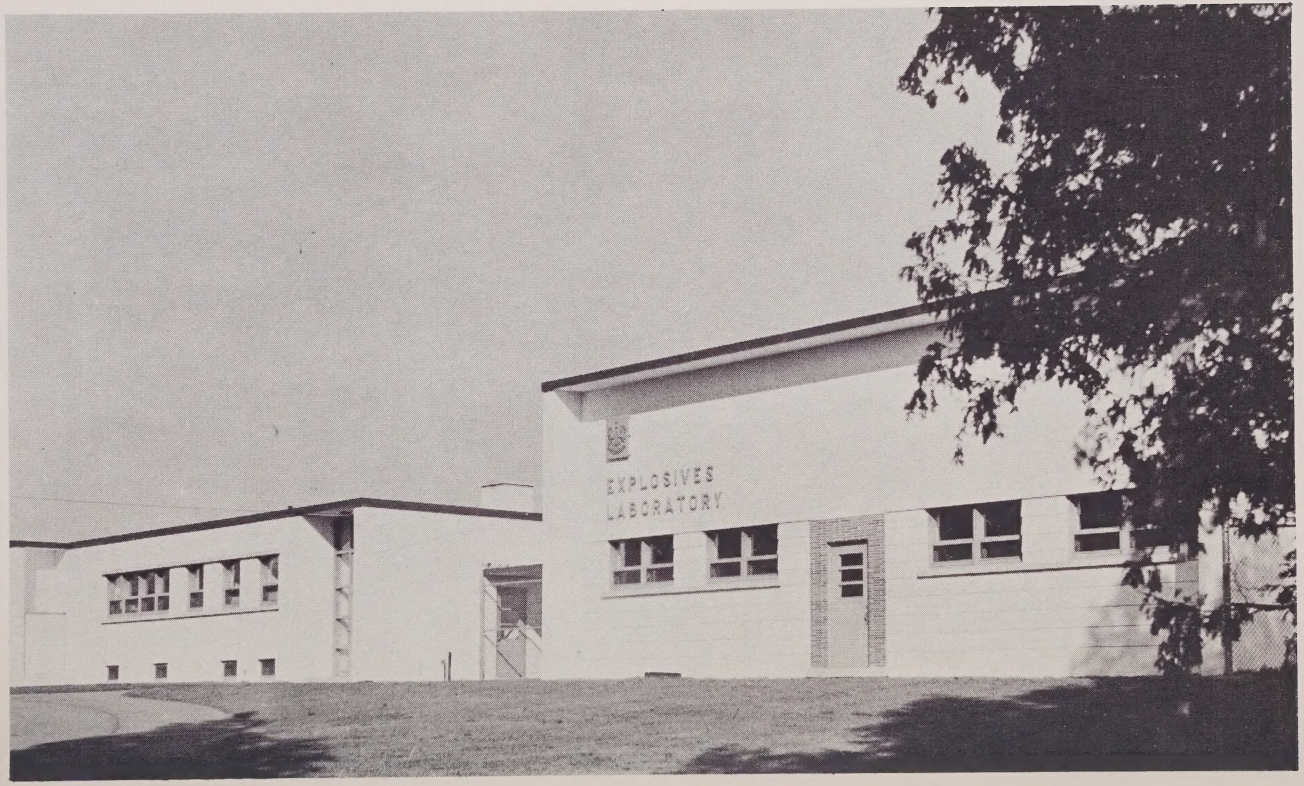
The Geographical Branch is concerned mainly with the terrain of Canada and its use and thus, to some extent, has an interest in all our natural resources. Land surface conditions, types of vegetation, the structure of towns and cities, the nature of the permafrost are investigated here. Typical projects include:

- compiling a new Atlas of Canada, now nearing completion.
- studying sea ice distribution in coastal waters.
- investigation of Canada's semi-arid regions with an eye on farming and living conditions. These and other land-use surveys contribute to orderly development of the country.
- providing reports on foreign areas of interest to Canada.
- maintaining a complete geographical reference library of publications, ground photos and maps and atlases of all countries.

Branch geographers are coping with an increasing demand for information on Canadian geography, particularly in the Far North. Their work can involve any area of the country and is of importance to economic development and to national defence.

Geographers compare an aerial photograph with a published map.




EXPLOSIVES
LABORATORY

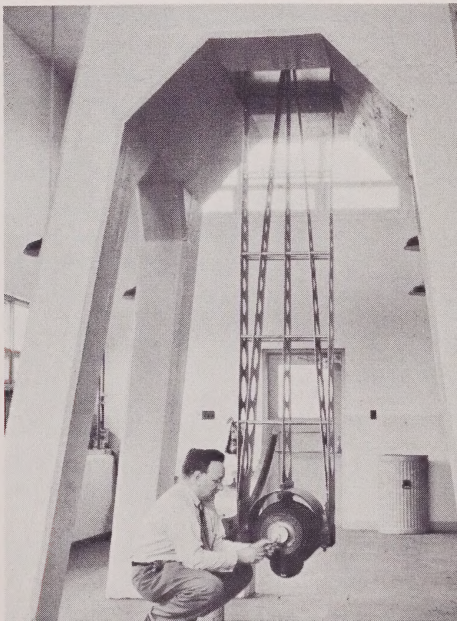
EXPLOSIVES DIVISION

Responsible for the administration of Canada's Explosives Act, the Explosives Division regulates the manufacture, authorization, sale, storage, importation and highway transportation of this potentially dangerous commodity. The sole concern: Public safety.

Testing for authorization is undertaken in a well-equipped laboratory where explosives—as many as 400 samples a year—are subjected to rigid examination before licences are granted for their manufacture or sale. This involves a chemical analysis to ascertain the explosive's composition; a series of physical tests to determine its power, sensitivity, stability and other properties; and Bichel-gauge tests to measure the emission of toxic fumes.

Division officers inspect factories, magazines, registered premises and other places where explosives are handled or stored, and investigate accidents involving explosives. The Division has done much to educate both industry and the public in safe procedures for handling explosives (it has published a number of widely-used booklets on the subject) and, generally speaking, its work has been a major factor in keeping the number of accidents in this category to a minimum.

Required for the work are chemists or engineers specializing or interested in the study of explosives.



Left—*Explosives Laboratory, Ottawa. Its facilities are used by the Explosives Division for test work and by the Fuels Division of the Mines Branch for special investigations.*

Right—*Ballistic mortar used in testing the power of an explosive. A sample weighing about one third of an ounce is detonated and the mortar's recoil measured.*

MINERAL RESOURCES DIVISION

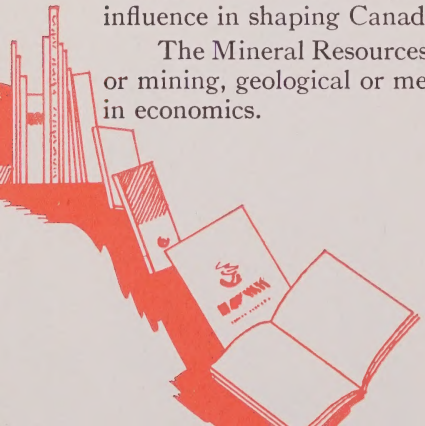
The work of the Mineral Resources Division lies in the realm of mineral economics rather than scientific research. It has the responsibility of keeping a weather eye on the mineral industry, studying and reporting its activities and assisting in the administration of some of the laws affecting it. The Division collects, records, compiles and distributes information on mineral resources, mining and oil companies, exploration work, and milling and metallurgical operations. Its officers undertake field surveys of all aspects of the industry and are in direct contact with its personnel, following every advance and development.

One of the Division's main responsibilities is the administration of the Emergency Gold Mining Assistance Act which involves, among other things, the inspection by a technical staff of all mines receiving assistance under the Act. Division officers also advise the Government on the taxation of mining properties and other aspects of mining legislation. They are members of many technical and federal agencies and have worked behind the scenes for the Royal Commissions on Canada's Economic Prospects and on Energy.

The Division is widely known for its publications among the most valuable of which are the annual reviews of production, consumption, marketing and other matters concerning 64 minerals. It issues more detailed economic studies of metals and fuels of current interest and prepares annual lists of Canadian metallurgical works, metal and industrial mineral mines, milling plants, coal mines and petroleum refineries. Also published are special monographs on matters such as mining laws, taxation and subjects of particular interest to the industry.

A consulting service for government and industry, the Division handles some 2,500 inquiries a year and is an important influence in shaping Canada's mineral policy.

The Mineral Resources Division employs mineral economists or mining, geological or metallurgical engineers with an interest in economics.



YOUR CHANCE

TO CARVE A CAREER

The Department of Mines and Technical Surveys offers a career in one of the world's leading research organizations, work with top-calibre scientists many of whom have received international recognition. Its members are brought in contact with their fellow professionals in industry, encouraged to join technical associations, to write technical articles and attend scientific gatherings. There is ample scope for creative ingenuity and initiative.

In brief: A career in the Department can be a rewarding one. There is also the satisfaction of helping to bring about the orderly development of Canada's resources, contributing to man's knowledge of the earth and its position in the universe.

FOR MORE INFORMATION . .

If you are interested in a position with the Department of Mines and Technical Surveys or wish to receive more information on its work, write to the Department care of the Chief of Personnel at Ottawa.

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